Composition of dust and the formation of black weathering crusts in Hungary and Germany

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Dust has a significant contribution to the formation the formation of black weathering crusts. Various limestone buildings showing black soiling were studied in Germany and in Hungary. Dust, crust and limestone samples were collected and analysed to understand the contribution of dust to black crust formation. Test methods included microscopic and SEM analyses and detection of mineralogical composition by using XRD. Since some elements and organic carbon act as catalyst for crust formation trace element distribution (LA-ICPMS) and organic carbon content were also detected.

According to analyses gypsum is the main secondary mineral of limestone weathering crusts both in rural and urban areas, although there are different concentrations detected in Germany and Hungary. Siliceous and carbonaceous fly-ash particles were found in both countries with the prevalence of the former one. Lead mostly accumulates in dust, but also common in the black crust. Surprising high concentrations were found at the crust/limestone boundary in the samples of Budapest and Cologne city centre. The dust composition reflects the setting but does not necessarily a good indicator of the environmental conditions.

Constructional problems at interventions into slaty sedimentary rocks in Slovenia in terms of fabric and composition

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In Slovenia, several open excavations and tunnels have been constructed in tectonically weakly metamorphosed shaly, silty to sandy sedimentary rock formations of Carboniferous age. During a typical process of excavation rocks are subjected to changes in stress direction, which can result in different types of failure. To a large extent, these failures depend on the direction of loading in relation to the most pronounced types of discontinuities. During design stage of road structures in Slovenia, however, incomparably greater attention is paid to the relevant laboratory geomechanical factors than to the effect of the textural-structural and mineralogical properties of the rocks. It is only in recent years that some attention has been paid to the research into the connection between the textural-structural and mineralogical properties of slates and clay-containing rocks and their weak geomechanical behaviour. Nevertheless, these researches are not taken into serious consideration yet. In order to determine more accurately the type of relationship between the petrographic characteristics of these rocks and their resistance to the point load, a series of petrographical analyses and corresponding point load strength index tests were performed. Samples were taken from trial boreholes and at excavation sites of the rock mass for the tunnels of the Ljubljana area as well as from the wider area of earthworks for the Ljubljana - Celje motorway in central Slovenia. The investigated rocks have mud to sand grain size. From the structural point of view, they exhibit clear dynamo-metamorphic changes. They are manifested with the occurrence of folds, crenulations, strong secondary foliation s_1, differential cleavage and fracture porosity. In contrast to primary foliation s_0, where the grains are intergrown, secondary foliation s_1 is smooth, and only insignificant intergrowing of the grains can be observed. At the micro level these deformations are expressed as recrystallization (mainly degradational), new growth,

pressure shadows, kinking of the phyllosilicates, and mechanical reorientation of the mineral components along s_1. Preferred orientation of the phyllosilicates and slaty cleavage (s_1) have developed, and represent one of the most pronounced structures along which the rock prefers to split. It was shown that in all cases a good correlation exists between the average point load strength index of the rock samples, the direction of loading, and the petrographic/fabric type in the samples without pre-failed surfaces. Failures in the slate and metasiltstone follow concentrations of preferred oriented phyllosilicates of the s_1 slaty cleavage in the first place. Other parameters (e.g. average grain size, granoblastic texture, quantity of quartz etc.) are of secondary importance and find principal expression in homogeneous rocks and in cases when they were loaded transversely to the main discontinuity. In the pre-failed rocks, the direction of loading played the major role. The relevance of the above stated facts is clearly manifested in the field of geotechnical works where their disregard led to landslides on the surface and to several mass collapses in tunnel works. The predominant direction of failure in-situ additionally depends on the geological macrostructure, and on the direction of intervention into the rock. Determination of the fabric and compositional properties of such rocks is a key factor for the identification of the weakest directions and for the appropriate and timely adaption of method and direction of excavation.

Mineralogical and microstructure characterization of a Neogene natural building limestone from Western Crete, Greece

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Natural building stones are being used in Crete for ages to build masonry structures because of being abundant, relatively easy to cut and shape and good performance in many applications. In Crete the largest comprehensive occurrences of Neogene sediments are found along the north-western coast (provinces of Chania and Rethymon), in the Heraklion depression and in the Sitia district, Eastern Crete. Several quarries for the extraction of Neogene limestone, being used as building and decorative natural stone, are located in Western Crete country. Despite their great variety, relatively few types of stone are suitable for construction materials. In addition to accessibility and ease of quarrying, the stone must satisfy requirements of strength, hardens, porosity, durability and appearance. Mineralogy and microstructure greatly influences engineering properties lime permeability, strength and durability. The present study summarizes the results of a primary investigation of a Neogene fossiliferous fluvio - lacustrine - brackish - shallow marine marly limestone, cropping out thirty km east of Chania, Crete. The combination of macroscopic rock description, mineralogical, chemical and microstructure analyses were used, in order to characterize the natural stones regarding their colour, lithology, microfacies, sedimentary structure and fabric.

The natural stone is macroscopically described as an unweathered white-yellow to white-grey homogenous compact limestone rock. The mineral composition was investigated by using X-ray diffraction (XRD) analysis. The main minerals present are calcite and quartz, whereas clays, micas and feldspars are present in minor amounts. The chemical composition was determined by wet chemical analyses. The results, illustrate that the composition of the major elements is in general monotonous with typical high contents of CaO (40 % wt.) and SiO_2 (17% wt.), followed by Al_2O_3 (5% wt.). In order to enhance the microscopic analysis of the rock fabric and to observe weathering phenomena, special treatment of the raw samples has been used before the preparation of thin sections. This consists of pore and microcrack staining by a mixture of epoxy resin and fluorescent dye. The prepared thin sections where then observed through a conventional optical microscope (Leica DMLP type), equipped also with a source of UV light. Microscopic investigations showed that, the Neogene formation consists of fossiliferous micrite marly limestones, which appear as moderately-sorted, fine